



Film Style and Technology in the Forties

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Film Style and Technology in the Forties

This article, carrying on from the analysis of the thirties begun in Film Quarterly for Fall 1976, describes technical developments that had a visible effect on films of the forties. It also examines certain independent formal trends, particularly that toward the long take, and provides new information on "reverse-angle" cutting, about which debate has been going on in France, England, and the US.

With a few noted exceptions, my analysis is confined to Hollywood feature production, and my basic sources, besides close examination of several hundred of the films themselves, have been complete runs of *The American Cinematographer* and *Journal of the Society of Motion Picture Engineers*.

CAMERAS

The only new 35mm camera produced in any numbers in America during the forties was the Cunningham Combat camera. This lightweight (13 lbs.) camera was especially designed for frontline use. However, it had no reflex viewing system, and was much less suited to its purpose than the Arriflex used by German military cameramen. Captured Arriflexes were in occasional use in Hollywood soon after the war. The subjective-camera opening sequences of Delmer Daves's *Dark Passage* (1947) were shot with a hand-held Arriflex, but application of this camera remained very limited in Hollywood. However, in Italy, where post-synchronization of dialogue was the rule, the Arriflex quickly became the major production camera. (All of the 35mm cameras mentioned in this section are too noisy to permit their use for filming with simultaneous synchronous recording of sound.)

In 1948 a competitor for the Arriflex appeared in France. This was the Eclair Cameflex, which like the Arriflex had continuous through-the-lens viewing, could hold 400 ft. of film, and weighed 13

lbs. unloaded. This camera had two slight advantages over the Arriflex: first, its shape permitted the back of the camera to be rested on the shoulder when hand-held, making long takes easier; second, the magazines could be changed in a few seconds, since the film loop and back pressure plate were in the magazine. The first feature had some effect on the Nouvelle Vague films of a decade later, but the immediate effect of this camera on French production was negligible: a clear-cut case of the dominance of aesthetic considerations over technical possibilities as far as the form of films is concerned.

During World War II a considerable amount of 16mm footage was blown up to 35mm for use in feature films, and from this point onwards 16mm cameras become important for feature-film production. The first quiet 16mm camera suitable for synchronous sound filming appeared in 1940. This was the Berndt-Maurer Pro camera, but it was quickly displaced by its descendant, the 1942 Auricon single-sound-system camera that is still with us today.

CAMERA SUPPORTS AND THE LONG TAKE

As I noted in my previous article, in 1939 a trend towards longer takes was just beginning to emerge among some directors, led by George Cukor. By 1940 Howard Hawks had definitely joined in, *His Girl Friday* having an Average Shot Length (A.S.L.) of 13 seconds, and so had William Wyler with an A.S.L. of 18 seconds for *The Letter* (1940).

(Prior to this both directors had been working with an A.S.L. of 9 to 10 seconds.) Other notable contributors to the trend included Henry King, George Marshall, Gregory La Cava, and Edmund Goulding. The net result of all this was that the Hollywood mean A.S.L. went up from about 8 or 9 seconds in the late thirties to about 10 or 11 seconds in the period 1940-1945, and finally to around 12-13 seconds in the period 1946-1950. These figures are taken from some hundreds of films of the period, but may exaggerate the trend slightly as the sample is biased towards the quality end of production. It would be a mistake, however, to suppose that there might be a significantly countervailing trend at the cheap end of the production spectrum, as the pressures of time there have always prevented the use of the large number of set-ups that are necessary to achieve a fast cutting rate. (For example, *Hoppy Serves a Writ*—G. Archainbaud, 1943—has an A.S.L. of 10 seconds.)

In 1940 these novel longer takes were achieved with conventional dispositions of the actors within the shot, with standard lenses, and without a greatly increased amount of tracking, though Hawks used more panning shots than usual. But already in the famous long take in *The Letter* (over 4 minutes), the lens is 35mm or a bit shorter, and the playing is between medium-close shot and long shot. This kind of approach was to become important shortly, and will be dealt with below.

Another approach to even greater take lengths involved increased camera mobility, and here the leading figure was Vincente Minnelli. *The Clock*, made in 1945, has an A.S.L. of 19 seconds. This film has many takes that are minutes long, and these are mostly covered with camera movement, even including the use of a crane for possibly the first time in a non-musical film.

Up to this point we have been treating situations that could be dealt with using equipment already available, but as new directors, including notably Otto Preminger, joined the trend, the demand for total maneuverability of the camera produced the crab dolly, which can be steered by all four wheels interconnected to turn together, as well as by the usual two-wheel steering. Hence it can instantaneously be turned from a straight forwards track to a sideways movement ("crabbing") at 90 degrees to

the original path. The first crab dollies produced were the Houston in 1946 and the Selznick in 1948. Both these dollies had mechanically rising center posts on which the geared head and camera were mounted, but a crab dolly with hydraulic rise was produced in 1950. (In the same year a really small crab dolly was introduced in Italian studios, the predecessor of the present Elemack Octopus crab dolly, and this was capable of passing through ordinary-sized doorways and passages. The result of its use can be seen in Rossellini's *Europa '51*, in the opening party scene.)

The introduction of the crab dolly is another clear-cut case of film technology meeting a purely aesthetic demand.

Given the style developments outlined above, it can be seen that Alfred Hitchcock's *Rope* (1948) and *Under Capricorn* (1949) were not isolated instances that appeared from nowhere, but the culmination of a trend to which Hitchcock did not contribute at first. For his early forties films have A.S.L.s near the mean for that period: *Saboteur* (1942) has an A.S.L. of 10 seconds. *Under Capricorn*, on the other hand, contains so few shots, and they are so long, that the exact value of the Average Shot Length no longer has much significance (although it is in fact around 40 seconds), since the nature of the particular screenplay written to be filmed with such very long takes begins to dictate the shot lengths. Put another way, it is only when there are upwards of 200 shots in a film that an averaging effect can take place that produces consistency of A.S.L. from film to film in the work of a director regardless of the subject matter of his films. And of course the concept of Average Shot Length has no meaning in the case of a film like *Rope* where the transitions between the dozen or so shots are concealed to give the illusion of just one continuous shot throughout the whole film.

It might be added that Hitchcock then dropped the whole idea and returned to shorter takes; *Stage Fright* (1950) having an A.S.L. of 9 seconds. In recent years he has moved to even faster cutting, following contemporary fashion.

LENSES

There were no significant new lenses introduced for feature film work in this period, but the first zoom lenses of modern design for 16mm use be-

came available at the end of the forties. These were the Zoomar lens in 1947, and more importantly the Som-Berthiot Pan-Cinor in 1950, both for 16mm cameras. Both had a zoom range only from 20 mm to 60mm, which rather limited their usefulness, and we have to wait till the fifties for zoom lens use to become significant. A cautionary note should be sounded about the use of optical zooms (progressive enlargement in an optical printer of a series of frames shot with an ordinary lens) in this period. An example occurs in *Colorado Territory* (Raoul Walsh, 1949), and there are probably a limited number of similar cases in other films. Although the change in perspective is exactly the same in an optical zoom as in a zoom made with a variable focal length lens, there is also an increase in grain size in the optical zoom which will be revealed by careful examination, and is noticeable to some viewers.

The first practical anti-reflective coatings were applied to camera lenses in 1940, and they came into general use from 1941. These ultrathin coatings cut reflection light loss at each lens surface, and also reduce lens flare. At the time of their introduction, claims were made that lens speed was increased by a full stop, but later tests found that only about a half-stop increase occurred. Nonetheless, the coatings made possible good wide-angle lenses and zoom lenses—both of which contain large numbers of lens elements.

GREGG TOLAND, DEEP FOCUS AND WIDE ANGLE LENSES

The first extensive use of coated lenses was in the photography of *Citizen Kane*, but before dealing with this film I should summarize what Gregg Toland had done beforehand. In the films Toland had lit under contract to Goldwyn during the thirties there is no sign of any deep focus in the *Citizen Kane* sense, nor is there much sign of the "Tolandesque" compositions that typify his work in the forties. However his thirties films do show a notable simplicity of lighting when compared with the usual lighting set-ups in similar scenes lit by other cameramen. It was really just a matter of Toland using less lighting units than anybody else, and thus having a slightly unusual disposition of shadows in his scenes. This is very evident in the lighting of *Come and Get It* (Hawks/Wyler, 1936), where the point at which Rudolph Maté and Wy-

ler took over from Toland and Hawks is quite obvious. The common Hollywood practice of having more than one cameraman on a film at different times is almost invariably undetectable by eye, but in this case the difference in the lighting of the last several minutes of the film (after the party scene) is very noticeable, particularly in the closer shots; the shadows, particularly the modelling shadows on the figures, have a softness of edge that Toland could not achieve. The lens diffusion is better handled as well after Maté took over. In fact Toland was never better than average at conventional "glamor" photography, as is quite noticeable in a number of poorly handled close-ups of Merle Oberon in *Wuthering Heights*, where her slightly difficult face (a bit flat around the eyes) is not shown to its best advantage.

But to return to our main theme. In 1940 Gregg Toland lit two films for John Ford, *The Grapes of Wrath* and *The Long Voyage Home*, and in these there are a very few shots where something of his *Citizen Kane* approach becomes evident. In *The Long Voyage Home* there are one or two low angles on the deck of the ship, and some typical Toland compositions in the crew's bunk-room, with darker foreground figure masses filling roughly triangular areas across one of the lower corners of the frame. There is, however, no deep focus at all in this film. But in *The Grapes of Wrath* a few proto-deep-focus shots are sneaked in, particularly in the shot where Tom Joad goes up to the exterior of his family's deserted house, moving past the camera from close-up to long shot, in sharp focus all the way.

Toland has given a good description of the photography of *Citizen Kane* in *The American Cinematographer* (February, 1941) so only a brief resumé is necessary here before making some additional points about this film. The film was shot with Super XX negative; the apertures used throughout were the range of f 8 to f 16. Toland claimed that only relatively wide-angle lenses of 24mm and 28mm were used. This means that typical depths of field would have been from 2 ft. to infinity with the 24mm lens at f 16, i.e., from a head-only "big close-up" to a very long shot, and from 4 ft. to 50 ft. with the 28mm lens at f 8—which still carries sharp focus from close-up to long shot on most of the sets. However, close examination of the film suggests that other lenses

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were used as well. The breakfast-table scene between Kane and his wife seems to have been shot with something like a 35mm lens, as do some of the closer shots of Susan Alexander elsewhere in the film. These latter also get conventional lens-diffusion treatment (so-called "soft-focus"), which is totally absent elsewhere in the film. The general absence of lens diffusion in *Citizen Kane* is made more noticeable by the sharp-edged lighting style resulting from the use of powerful arc floodlights without fill lighting in most of the film, and in this reduction of lens diffusion *Kane* was in advance of its period, for it was not till the late forties that it became usual to limit diffusion to a handful of key close-ups in a film. How important Toland was in causing this trend is not, however, clear. The increasing industry experience with Technicolor photography, where lens diffusion had never been extensive, may have contributed, as may have non-photographic concerns with "realism" in the late forties. It is also possible that just as lens diffusion had been taken over into films from its earlier use in still photography, so this reaction against its extensive use may have been influenced by a change in opinion among still photographers of the late thirties as to what was beautiful or pleasing in photographs in general and portraits in particular. One thinks especially of the rise of photo-journalism in magazines like *Life*.

The use of coated lenses made some small contribution to the use of a smaller aperture with given light levels, but more importantly, these lenses made possible sharp black and white images in "against the light" filming situations such as the scene in the projection room at the beginning of *Citizen Kane*. In this case, with earlier lenses the figures silhouetted by the strong arc beam from the projection booth would have been turned from crisp black to grey by a wash of flare, and their edges would have been blurred.

The apertures mentioned as having been used in the photography of *Citizen Kane* could have been achieved by lighting with large arc spotlights of the kind available from the twenties onwards, applying them from above the walls to the set in the conventional way, but this would have meant avoiding the kind of low-angle shots used extensively in *Citizen Kane*. Once the decision had been taken to use low angle shots—presumably by Gregg Toland



Proto-"deep focus" with wide-angle lens in *GRAPES OF WRATH*

or at his suggestion, since he had flirted with this approach before—then of course the sets had to have ceilings on them, and this in its turn meant that powerful arc floodlights had to be applied from floor stands if ridiculous lighting patterns were to be avoided. Hence the use of the Duarc floodlights actually used by Toland. These had been available from before 1938, as had 25mm lenses, and with the introduction of Super XX negative in that year, deep focus in the Toland style had been possible for anyone who wanted to try it. And true deep focus *without low angles* was possible even before that for those prepared to meet the higher electricity and wages bill. So Toland's creation of "deep focus" filming was an aesthetic decision simply, without being produced by technological pressures.

The other aspect of *Citizen Kane* which was to prove most influential through the forties was the disposition of actors within the field of the wide-angle lens. This followed the pattern already described for some shots in *The Long Voyage Home*, with even stronger emphasis on the triangular areas of foreground mass, and on the implied diagonal of interest between the foreground figure placed towards a lower corner, and the head of the background figure towards the opposite top corner. This sort of composition and staging in depth was gradually taken up by many film-makers, although they usually did not bother about the deep-focus element of it, but often let the foreground figures go a little out of focus. The heavy and broad chiaroscuro of *Citizen Kane* was also not taken up in general. One of the first films where the influences of *Kane* are visible in the way

described in *The Maltese Falcon* (John Huston, 1941), where an even wider angle lens was used for some shots—a 21mm lens in fact. Probably the most direct imitation of *Citizen Kane*, both in screenplay and lighting, was Cukor's *The Keeper of the Flame* (1943). For this film William Daniels used a number of low angles somewhat in the Toland manner, and also a fair amount of heavy chiaroscuro, but with far softer-edged shadows and a somewhat greater complexity of shadow disposition. And naturally Toland took his ideas with him to the films he subsequently photographed for William Wyler, though he dropped the heaviness of the *Citizen Kane* chiaroscuro. Finally, on *The Best Years of Our Lives*, by increasing the light levels even further, and stopping down to f 22, he managed deep focus in some shots made with a 50mm lens.

Contrary to what is sometimes claimed, *Citizen Kane* is not exceptional for its period as regards take length. Its A.S.L. is only 12 seconds, and it only contains a couple of takes that get up around 2 minutes. But the method of staging within the field of view of a wide-angle lens in *Citizen Kane*, which has already been remarked upon, proved to be important for the subsequent development in the later forties of another current in long-take filming. This current in the long-take trend mostly avoids the use of tracking shots, and further than using the careful staging in depth in the way described, keeps the takes going with pans if actor movement necessitates it. This path proved congenial to some older directors as well as to newcomers, a prime example being Henry King, ten-

tatively in *The Song of Bernardette*, and markedly in *Twelve O'Clock High* (1950) and *The Gunfighter* (1950) with A.S.L.s of around 12 seconds. Another well known director who took naturally to this method was Billy Wilder, for whom a good example would be the way many of the dialogue scenes in *Double Indemnity* (1944, A.S.L. 15 secs.) are covered. As a result of these practices involving the frequent use of wide-angle lenses, by 1950 in many studios a 35mm lens had come to be regarded as a standard lens, whereas in the thirties a 40 or 50mm lens was regarded as a standard lens.

The two ways of filming with longer takes already described, that is, using a mobile camera and standard lenses, or alternatively using wide-angle lenses and staging in depth, were to a considerable extent separate, for extensive tracking with a wide-angle lens can be visually disturbing; but naturally directors using these methods sometimes used fairly conventional staging of the action and still managed to keep a shot going to greater lengths than usual. And in fact there was a third stream in the longer-take trend, involving directors both old and new who were perhaps less filmically imaginative, and who used perfectly conventional stagings and standard lens photography, but still produced longer takes in their films in the late forties. Examples which spring to mind include George Marshall's *The Blue Dahlia* (1946) with an A.S.L. of 17 seconds and Joseph Mankiewicz's *The Ghost and Mrs. Muir* (1947) with an A.S.L. of 13 seconds.

And finally a great many directors ignored all this and went right on doing what they and others had been doing in the thirties, fast cutting and all.

KEEPER OF THE FLAME



ANGLE-REVERSE ANGLE CUTTING

The forties are a good point from which to survey the development of "angle-reverse angle" cutting in mainstream American cinema, for it was in this period that this stylistic figure reached its peak exploitation. And it is truly a figure of style, for the use of this kind of cutting varies from period to period, and from director to director, as will be shown. Angle-reverse angle cutting is taken to include all cuts which change the camera angle from a direction which is within 45 degrees of the eye-line of a person appearing in a shot through a sufficient angle to fall within 45 degrees from the

eyeline of the other direction. The camera can be behind or in front of the shoulders of the two actors whose eyelines are under consideration, but pairs of shots in which the camera is well back from all the participants in the scene are excluded from the category. The general category of "angle-reverse angle" cuts is also taken to include cuts from a shot of a watcher to a shot of what is seen from his point-of-view (P.O.V.), as this seems to be the usual editor's attitude to the definition. Usually these watcher-P.O.V. pairs of shots form quite a small percentage of the total, though here again there is some variation from director to director. For instance, it seems that Alfred Hitchcock uses the point-of-view shot far more than other directors, and such cuts make up about half of his rather high proportion of angle-reverse angle cuts. (*Strangers On A Train*, 1951, has about 50% angle-reverse angle cuts, and *Family Plot*, 1976, has 49%.) The high proportion of P.O.V. shots in Hitchcock's films can fairly obviously be related to what might be figuratively called a "voyeuristic"

strain in his personality, and also to the explicit use of voyeuristic situations in his films. As traditionally recognized, this device is also an obvious way of securing audience involvement, and is really in no need of further explanation.

The quickest way to treat this matter more fully is to quote a list of the percentages of angle-reverse angle cuts out of the total number of shot transitions for various films. It should be noted that the figures quoted are approximate, and subject to several percent error, since they were arrived at by sampling 30-minute sections of the films involved, but this small uncertainty cannot call into question the general conclusions that will be drawn. Altogether about 250 films have so far been checked for this quantity.

One can see from the typical figures below, as from the far larger number not quoted, that some sort of consistency can be detected in the use of reverse-angles by some directors; note the figures for Anthony Mann, John Stahl, King Vidor, Howard Hawks and Raoul Walsh. However, these

Merry-Go-Round (R. Julian, E. von Stroheim, 1922)	16%	Unfinished Business (G. LaCava, 1941)	38%
Phantom of the Opera (R. Julian et al., 1925)	10%	Gentleman Jim (R. Walsh, 1942)	36%
The Cradle Snatchers (H. Hawks, 1927)	30%	Casablanca (M. Curtiz, 1942)	50%
Trent's Last Case (H. Hawks, 1929)	18%	The Purple Heart (L. Milestone, 1944)	18%
A Girl in Every Port (H. Hawks, 1928)	28%	Objective Burma (R. Walsh, 1945)	24%
Bad Sister (H. Henley, 1931)	21%	Salty O'Rourke (R. Walsh, 1945)	23%
Mad Genius (M. Curtiz, 1931)	51%	White Heat (R. Walsh, 1948)	33%
Red Dust (V. Fleming, 1932)	29%	The Adventures of Don Juan (V. Sherman, 1948)	62%
Back Street (John Stahl, 1932)	25%	Key Largo (J. Huston, 1948)	45%
Dr. Jekyll & Mr. Hyde (R. Mamoulian, 1932)	41%	All the Kings Men (R. Rossen, 1949)	15%
Counsellor at Law (W. Wyler, 1933)	17%	The Gunfighter (H. King, 1950)	20%
It Happened One Night (F. Capra, 1934)	18%	Lady Without a Passport (J.H. Lewis, 1950)	21%
Now and Forever (H. Hathaway, 1934)	29%	Broken Arrow (D. Daves, 1950)	53%
Fury (F. Lang, 1935)	29%	All About Eve (J. Mankiewicz, 1950)	65%
The Devil is a Woman (J. von Sternberg, 1935)	33%	Winchester '73 (A. Mann, 1950)	28%
Show Boat (J. Whale, 1936)	25%	On Dangerous Ground (N. Ray, 1951)	56%
Dodsworth (W. Wyler, 1936)	32%	Moulin Rouge (J. Huston, 1952)	33%
Road to Glory (H. Hawks, 1936)	28%	Bend of the River (A. Mann, 1952)	33%
Ceiling Zero (H. Hawks, 1936)	28%	El (L. Bunuel, 1953)	28%
Holiday (G. Cukor, 1938)	21%	From Here to Eternity (F. Zinneman, 1953)	34%
Suez (A. Dwan, 1938)	10%	On the Waterfront (E. Kazan, 1954)	63%
Rebecca of Sunnybrook Farm (A. Dwan, 1938)	19%	The Far Country (A. Mann, 1955)	25%
Midnight (M. Leisen, 1939)	23%	Man Without a Star (K. Vidor, 1955)	25%
When Tomorrow Comes (John Stahl, 1939)	32%	War and Peace (K. Vidor, 1956)	32%
Wizard of Oz (V. Fleming, 1939)	40%	Lust For Life (V. Minnelli, 1956)	33%
Roaring Twenties (R. Walsh, 1939)	22%	The Searchers (J. Ford, 1956)	18%
They Drive By Night (R. Walsh, 1939)	31%	Arizona Bushwackers (L. Selander, 1967)	72%
Manpower (R. Walsh, 1940)	55%	Barquero (G. Douglas, 1970)	22%
Dark Command (R. Walsh, 1940)	40%	Cry of the Banshee (G. Hessler, 1970)	24%
Waterloo Bridge (M. LeRoy, 1940)	43%	The Crowd (K. Vidor, 1928)	24%
I Love You Again (W.S. Van Dyke, 1940)	38%	H.M. Pulham, Esq. (K. Vidor, 1940)	23%
Strawberry Blonde (R. Walsh, 1941)	40%	The Champ (K. Vidor, 1931)	20%
High Sierra (R. Walsh, 1941)	24%	Un Homme et Une Femme (C. Lelouch, 1965)	4%

percentages are very far from showing the consistency through a director's work that other style parameters such as average shot length and closeness of shot have been found to have. As far as Hawks is concerned, it is important to know that his silent films are mostly shot in very different styles, and it would be difficult for the uninformed viewer to guess that they were all made by the same person. In fact from a formal point of view his style did not begin to settle into a consistent pattern until the thirties, so one cannot expect much consistency in style measures derived from his silent films.

Another anomaly is apparent in the figures for Walsh's films of the very early forties, but this was the period when higher-than-average percentages of angle-reverse angle cuts began to appear in the work of other directors, and Walsh may have been temporarily responding to the new trend. The highest figures of all seem to be restricted to some of the directors who started to make films in the forties or later such as Kazan, Sherman, and Mankiewicz. (Nothing above 60% angle-reverse angle cuts has so far been found for any director who started his career before the forties, and continued on through this period.)

Looking back to the early history of this stylistic figure, its definitive development took place around 1915 by Reginald Barker and Ralph Ince, who were the first to get an appreciable number of angle-reverse angle cuts into their films. However they were exceptional at that time, most films then having none at all, and D. W. Griffith having a vanishingly small percentage in his films then and later. (*Birth of a Nation* has about three such cuts out of approximately two thousand in its 2½ hour length.) The figures quoted here for the Rupert Julian films are quite typical for American films of the early twenties, but European films often still had no reverse angles at all. In the later twenties many Hollywood films had 20-30% reverse-angle cuts, and as can be seen the figures kept going up in the thirties. The 51% figure for *Mad Genius* (1931) is quite exceptional for that period as far as is known at the moment. On the other hand, note the remarkably low figure for Dwan's *Suez* (1938), a film which would certainly be considered a typical "classical Hollywood movie" by the casual

viewer. What we see here is an example of the inability of film directors to move too far away from the styles holding when they started directing, and the same effect is visible, as regards the device under discussion, in the work of King Vidor and others.

Not very surprisingly, there is some correlation of lowish percentages of angle-reverse angle cuts with the films of directors inclined to use long takes, and particularly with films using wide-angle lens staging of the kind described earlier (e.g., *All the King's Men*, *Lady Without a Passport*, and *The Gunfighter*).

The figures quoted at the end of the table for quite recent films reflect the fact that in the large numbers of sixties films that have been checked but not quoted, the fullest range of percentages of reverse-angle cuts continues to occur in different films. Nevertheless, the last three quoted values are extremes, and the bulk of films continue to have 30-40% reverse-angle cuts, as they have had since the thirties.

All these results show once more that there were continual style changes at work in what often seems to be regarded as the stylistically monolithic "classical cinema." Although those who make play with this term are always careful not to define exactly what they mean by it, it seems that they are referring to Hollywood films of the thirties and forties in general. It has even been implied (D. Dayan in *Film Quarterly*, Fall 1974) that the majority of cuts in "classical cinema" are angle-reverse angle cuts, and that this is the result of the exploitation of deep psychological forces in the audience's minds. Apart from the fact that in the vast majority of films such cuts form a minority, there is no doubt that films without them can work powerfully on the audience—e.g., *Birth of a Nation*. And further, if the device is so powerful, why is it not pushed to extremes (say 70%) in *all* commercial films, rather than just a few? In any case, deep explanations are unnecessary, since there has always been a direct and commonsense explanation for most uses of the angle-reverse angle device. This is that the expression on a person's face is far easier to read from the front than the side, so actors communicate more when shown from the frontal direction. Another prac-

tical advantage of angle-reverse angle cutting is that it ensures a large change of angle on every cut, which makes the matching of actor positions on either side of the cuts easier. (If all cuts in and out between closer shots and longer shots are straight down the lens axis, the smallest discrepancy in the positions of objects, including actors, common to both shots is immediately obvious to the viewer, and will slightly disrupt smooth continuity. Such discrepancies are the better concealed the greater the angle change across the cut.)

If one insists on a deeper explanation for the occurrence of the angle-reverse angle device beyond the direct ones just given, then scientific psychology (as opposed to psychoanalysis) is in a position to supply one in terms of optimum cortical-arousal levels in brain functioning; this in its turn being related to current neurophysiological investigation in a close way. The point is that the organism requires sufficiently varied external stimuli (in this case visual stimuli) for its well-being and satisfaction: not too much and not too little, leaving room for a certain amount of intermediate variation. As far as film is concerned this means the audience being presented with sufficiently varied views in one way or another, either by angle changes in the way described above, or by cutting to different shots, or by camera movement.

Incidentally, the claim made by Dayan (following J. P. Oudart) that there was a taboo on the actor looking directly at the camera is only true for several years from the late thirties into the forties, and even then not quite completely. For instance, Custer turns to the camera and addresses a line directly to it in the early stages of *They Died With Their Boots On* (1941), and it is quite likely that an exhaustive search would turn up other examples in ordinary dramatic films. Before and after this "High Hollywood period," a brief episode in the history of the cinema, the device was even more common, and offhand it is quite easy to point to *The Mad Genius*, *Hatchet Man*, and *Dr. Jekyll and Mr. Hyde* (all 1931) which contain numerous close-ups directed straight at the camera. Then from Chaplin's *Monsieur Verdoux* (1945) onwards the use of the effect increases again, both in America and Europe.

LIGHTING

Because of the move to faster film stock and lower light levels which had already occurred at the end of the thirties, less powerful (and smaller) lighting units had been called for, since it was not possible to reduce the *number* of lights used on a particular set to produce these lower light levels without changing the style of the lighting. So in 1940 small spotlights with Fresnel lenses and 150- or 300-watt tungsten bulbs were introduced. They were in fact just miniature versions of the larger incandescent bulb spots with Fresnel lenses ("inkies") that had come into use in the middle thirties, and like them they focussed from parallel-beam spot to medium-flood positions. They were colloquially referred to as "dinky inkies" or just "dinkies."

But the most significant development in new lighting equipment produced in 1940 proved to be, in the long run, the introduction of photoflood bulbs with reflecting surfaces inside the glass envelope of the bulb. Developed by General Electric, these bulbs were just as we know them today, producing an even floodlighting from a 200-500 watt tungsten filament. Because of the excess voltage they worked under they supplied more light than the equivalent longer-lasting standard tungsten bulbs used in film lights. These photoflood bulbs were not used for feature-film work till the later forties, when some cameramen began to use groups of several of them mounted closely together as a floodlight to give fill lighting on close-ups.

A survey of the light levels used for interior filming at the major studios published in the July 1940 issue of the *American Cinematographer* gave results which can be summarized as follows. Nearly all the negative in use was Kodak Plus-X, and at Warner Brothers and Paramount the light levels were around 60 foot-candles and the usual camera aperture was f 2.3. At RKO and MGM the light levels were around 150 foot-candles for an aperture of f 2.5, and at Columbia and United Artists the levels were 40 foot-candles for an aperture of f 2.3. The position at Twentieth Century-Fox was quite different, for at that studio there was a rigid policy to photograph everything on interior sets at f 3.5 with a light level of 150 foot-candles.

It is clear from considering the manufacturer's recommendation of f 2.3 for 100 foot-candles and

f 3.5 for 250 foot-candles that all the studios except RKO and MGM were underexposing the film and then compensating for this by increased development, while RKO and MGM were overexposing and giving reduced development. As a result, films from the former group of studios would tend to be much more contrasty than films from the latter pair, which would tend to have more greys than blacks and whites. (Of course the general contrastiness of the image is also controlled up to a certain point by the lighting ratio between the lighted and shadowed parts of the scene, a ratio determined by the individual cameraman, but this cannot completely override the effect previously described.) A particularly fine example of lighting within the general MGM look just described is given by William Daniels's work on *New Moon* (1940). Here there is a continuous succession of shots with an intricately worked chiaroscuro in grey tones, and disposition of the grey shadows being controlled in their placement to a degree that no one ever surpassed, and few equalled.

Given the figures quoted above, it is clear that all the studios except Fox were working at maximum lens aperture, and hence at the position of worst definition of any lens, whereas one can see quite clearly in Fox films the extra image sharpness and slight increase in depth of field resulting from reduction in lens aperture. These qualities are already evident in the 1939 *Frontier Marshall* for instance, and there, as in some other subsequent Fox films, they prevent the invisible integration of background projection into studio scenes, making that technique unfortunately noticeable.

Noting briefly the possibility of a connection between Gregg Toland's first dalliance with deep focus on *The Grapes of Wrath* and the standard photographic procedures of the studio where it was made, we turn to the issue of increased set lighting levels causing higher studio electricity bills, which was often given during the forties as a reason for not using deep focus.

One can see from the figures already given that the notoriously penny-pinching Columbia and Warners studios were using the lowest possible light levels, though in fact the tripling of energy consumption to achieve a level of 150 foot-candles would only have cost them a few dollars extra per day per studio set. Further increases to go to actual

"deep focus" levels would still be extremely small amounts in terms of total film budgets, but a more important cost which would begin to appear at this point would be the increased wages of the extra electricians needed to rig and stand by the extra lighting units (or the larger lighting units), a cost that does not occur for smaller increases in light levels.

The post World War II move to location filming was an aesthetic choice, no doubt induced by the experience of all concerned with documentary film during the war, and the move was made in the first place with the already available technical equipment, both in Italy (*Roma, Città Aperta*, 1945) and America (*Naked City*, 1947). Given that the Italian films concerned were post-synchronized entirely and the American ones partially, there was no technical reason why this step could not have been taken in the late thirties if the desire to do so had existed. But once the move to location filming was under way some new lighting equipment appeared to help it along. This was the Colortran lighting outfit, which consisted of several 500 watt and 1 kilowatt lamps, with a total wattage low enough to be powered from ordinary building circuits instead of the heavy generators formerly carried along by film crews. In the lampheads, which only weighed a few pounds, were contained very large bulbs with internal reflecting surfaces that produced spot or flood beams depending on their shape. The voltage applied to the lamps, which was again in excess of their normal rating, could be varied, and hence both the brightness of the lamps and the color of their light could be varied. A 1kW Colortran lamp gave roughly the same amount of light as an ordinary 2kW light, although it was several times smaller and lighter. These units probably had more use in the ever expanding 16mm production of subsequent years, but they were occasionally used to help out on bigger films.

As far as the style of lighting on these location films of the late forties is concerned, we can return to our two leading examples and say that in *Naked City* there is visible some simplification of the lighting over what would be expected in a studio film with a similar subject made in the same year, although in general the type of lights used and the angles from which they are applied are still the same. But the number of units used seems to be

reduced somewhat, and also the care in choice of precise angles and shadings. In the case of *Roma, Città Aperta*, it is important to realize that it contains some studio-shot scenes, particularly those in the Gestapo headquarters, and in these the lighting has the polish one would expect from a European film of this vintage, i.e., slightly less than that in an American film. The location interiors are lit with only a very few lights, but these are still carefully disposed. The roughness in these scenes is in what is lit rather than the way the light is applied. But it is in the exteriors, always the crucial test of finesse in applying extra artificial light, that the great crudity in lighting can be seen. The fill light is just bashed straight on from the front, and in some long shots there is none at all, even though they are taken on the kind of overcast day with grubby natural light that is ordinarily avoided, or if not avoided, then sharpened with artificial light.

OPTICAL EFFECTS AND SHOT TRANSITIONS

If we expect the development of a travelling matte system for use with the Technicolor process exclusively (*The Thief of Baghdad*, 1940) there were no major advances in optical effects during the forties. The introduction of the Acme-Dunn automatic optical printer in 1943 only increased the efficiency of the basic machine by exposing a series of frames automatically under the control of instructions punched into a paper tape. This increase in efficiency could have only had a visible outcome in an increase of the number of optical effects used in films, and it is quite easy to think of reasons why this did not happen.

As far as shot transitions in general are concerned, the key event was of course the use of what would now be called "jump-cuts" in *Citizen Kane* (1941) though Orson Welles referred to them at the time as "lightning mixes." In that film they are mostly accompanied by purposefully conspicuous sound cuts, which indicate how they had been arrived at—that is, by derivation from radio-play technique. These not entirely unprecedented jump cuts had very little influence on American practice, and it is difficult to point to much noticeable use of them other than the odd sneaky occurrences in the middle of fast action sequences in a small number

of films made in Hollywood in the forties. The situation was slightly different in England. There the use of the occasional "shock cut" (jump cut with a very strong visual and sound discontinuity) had become commonplace by the late forties, but the major figure most given to the use of jump cuts between dialogue scenes was Michael Powell (*I Know Where I'm Going*, 1945, etc.)

The wipe continued to be extensively used to indicate a short time lapse, particularly in action subjects and sequences at most studios, and very extensively on all subjects at Warner Brothers. The Warner editing department used a whole range of simple lateral wipes with edges of varying softness, all the way from an almost hard-edged wipe to a wipe with the edge so fuzzy and broad that it covered the whole frame and was almost indistinguishable from a dissolve. (The truly hard or sharp-edged wipe was no longer used on feature films in the forties.) The range of Warner wipes can be studied in action in Howard Hawks's *Air Force* (1943).

There was still no sign of extensive use of wipes freeing the dissolve to be used for some other purpose other than indicating a time-lapse, but an interesting isolated use of alternative meaning being attached to dissolves occurs in *Waterloo Bridge* (1940). In this film, during a romantic scene in which the hero and heroine dance to a small orchestra, the transitions between shots of the couple and shots of the musicians are achieved by a series of dissolves, although strict time continuity is indicated by the continuous synchronous music from the orchestra. Elsewhere in the film dissolves are used conventionally to indicate short time lapses, and as might be expected in an MGM film, no wipes are used. This "lyrical" use of the dissolve as a form of softer or weaker cut seems not to have reappeared till the fifties, and not to have become standard practice till the sixties.

SOUND RECORDING

There were no major developments in sound recording in Hollywood in the forties except the introduction of magnetic recording in 1949, and this had no great use till the fifties. Otherwise there continued to be a few slight improvements in the various stages of sound-on-film recording, but these had no effects on film form or style.

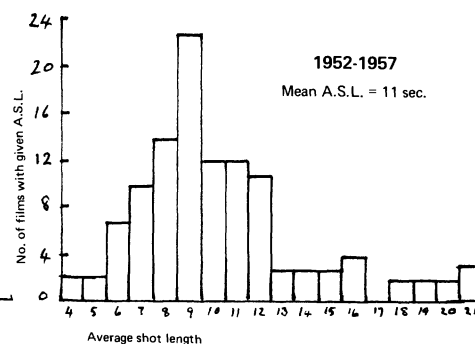
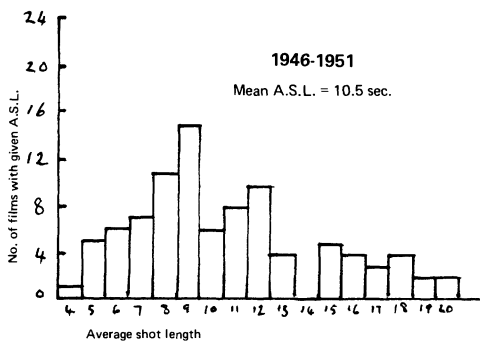
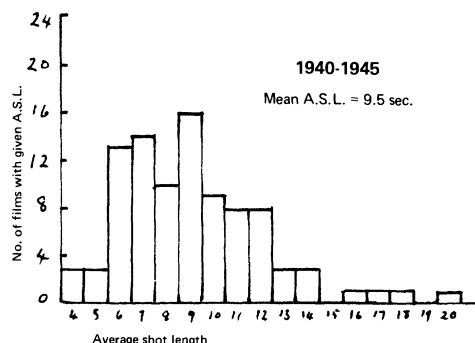
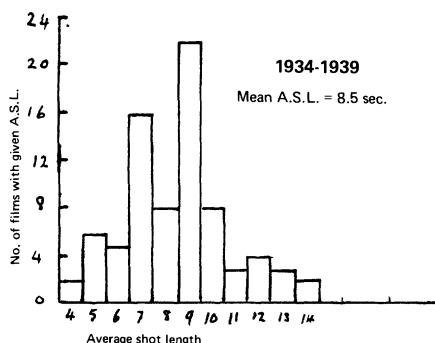
CONCLUSION

The major formal development in American film-making during the forties, the emergence of a trend towards long-take filming, can be graphically illustrated with histograms (bar-charts) which show the numbers of films with different Average Shot Lengths (A.S.L.s) in samples of approximately one hundred films from each of the six-year periods 1934-1939, 1940-1945, 1946-1951, and 1952-1957.

One can immediately see that for 1934-1939 the distribution of A.S.L.s is approximately symmetrical about the mean value, which also roughly coincides with the modal (most usual) value of 9 seconds. Further than this, it looks like an irregular approximation to a Gaussian (normal or binomial) distribution, which describes naturally occurring things like the heights of people in a population. The irregularity can be ascribed with some confidence to two main factors. If the sample were larger—say a hundred additional films in each period—some smoothing of the curve would be

likely. In addition, the films represented here were not a completely random collection, but taken from the offerings of British television and the London National Film Theatre over the last few years, both of which use *auteur* and related principles to organize their programs. When we move on to the later distributions we can see the appearance of numbers of films with high A.S.L.s, up to 20 seconds, but these numbers do not increase much beyond what had been achieved by the late forties. (In the late fifties another new and rather surprising development began. But that is another story.) Notice also that as the mean value of the average shot length keeps increasing over all these years, the modal value—the length of shot used most frequently—stays the same, at 9 seconds. This corresponds to the persistence of the majority of directors in shooting most of the shots in most of their films in the way they had always shot them.

One might wonder if the practices of individual editors, and indeed of studio editing departments, had any influence on the average shot lengths of



particular films. In the thirties it was claimed by technicians that the cutting was fast at Warner Brothers and slow at MGM, and although on the basis of the figures collected so far, and remembering in particular the Tarzan films mentioned in a previous article (*Film Quarterly*, Fall 1976), the MGM part of the claim must be doubtful, it does seem to be the case that Warners films in the later thirties are *on the average* cut faster than those from other studios. Although certainty in this waits on the collection of even larger numbers of A.S.L.'s, one can see that there were no contract directors at Warners in the thirties who went in for long takes at all, although there were very rare visitors such as Howard Hawks and William Wyler who made films tending in this direction. The former's *Ceiling Zero* of 1936 has an A.S.L. of 12 seconds and the latter's *The Letter* of 1939 has an A.S.L. of 18 seconds, despite their being edited by regular Warners editors (William Holmes and George Amy respectively) who did not impose on them the kind of cutting rates used in their regular work for Michael Curtiz and others. In fact at this period Curtiz's films have an A.S.L. of 6 to 7 seconds consistently, and Mervyn LeRoy's an A.S.L. of 9 seconds, even though they were not all cut by the same editors. Of the other Warner directors, Enright and Keighley worked with A.S.L.s of 5 to 6 seconds and Mayo and Goulding with 9 to 10 seconds. This last value is as high as regular Warner directors went in the thirties, but when the long take trend was well under way in Hollywood in the late forties some of the Warner directors moved with it to some extent. For exam-

ple, Curtiz went up to an A.S.L. of 9 seconds with *Mildred Pierce* (1945), and then on to 10.5 seconds with *The Unsuspected* (1947) and *Flamingo Road* (1949). And newer Warner directors like Curtis Bernhardt and Jean Negulesco were up to A.S.L.'s of 12 seconds by this time.

Although some of the directors who helped to consolidate the trend towards longer takes had come into films from the theater fairly recently, there were others involved who had been in Hollywood for decades, particularly amongst those who began the movement in 1940, so the cause of this development cannot be the influence of the theater. Perhaps here, as in other situations, we should opt for the simplest possible explanation—that directors bored with shooting film after film in the studios, according to the minutely broken-down shot patterns that had prevailed for so many years, seized with relief upon the new and thus challenging longer-take style once it had been pioneered in *Holiday* (1936) and subsequent films made by George Cukor. Pure novelty is, after all, a considerable aesthetic force in itself.

Long-take filming also has the advantage of preventing the ever more obtrusive producers from interfering with the editing of a film. (In 1927 there were 34 producers or supervisors involved in the production of 743 feature films in Hollywood. In 1937 220 producers worked on 484 movies. The number of directors working in the respective years hardly changed going from 246 to 234.) The next steps from this last piece of information take us onto ground that has been well trodden in writing about films since the thirties.

BRIAN HENDERSON

SEGMENTATION

The earth it selfe being round. every step wee make upon it, must necessarily bee a segment. an arch of a circle.

—John Donne, *Sermon LXVII*.

In film studies as in other disciplines, old problems tend to reappear under new names. What

are the basic units of film? How are they (or how should they be) combined in the filmic composition? These are the oldest, most frequently asked questions in film theory. Film semiotics has its own history within the larger history of film theory, though it has always presented itself as bypassing or supplanting earlier efforts. Since it